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Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army **DATE:** February 2011

APPROPRIATION/BUDGET ACTIVITY				R-1 ITEM NOMENCLATURE							
2040: <i>Research, Development, Test & Evaluation, Army</i> BA 3: <i>Advanced Technology Development (ATD)</i>				PE 0603772A: <i>Advanced Tactical Computer Science and Sensor Technology</i>							
COST (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
Total Program Element	50.856	24.873	30.600	-	30.600	33.563	37.735	38.945	39.609	Continuing	Continuing
101: <i>Tactical Command and Control</i>	13.441	14.702	15.289	-	15.289	15.391	17.566	17.892	18.195	Continuing	Continuing
1AA: <i>Tactical Computer Science Demonstrations (CA)</i>	3.781	-	-	-	-	-	-	-	-	Continuing	Continuing
1AB: <i>SENSOR DEMONSTRATIONS (CA)</i>	6.764	-	-	-	-	-	-	-	-	Continuing	Continuing
243: <i>Sensors and Signals Processing</i>	26.870	10.171	15.311	-	15.311	18.172	20.169	21.053	21.414	Continuing	Continuing

Note

FY10 funding realigned to higher priority efforts.

A. Mission Description and Budget Item Justification

This program element (PE) matures and demonstrates technologies that allow the Warfighter to effectively collect, analyze, transfer, and display situational awareness information in a network-centric battlefield environment. It matures and demonstrates architectures and provides technologies that enable synchronized Command and Control (C2) during rapid, mobile, dispersed, and Joint operations. Project 101 matures and develops software applications to more effectively integrate mission command across all echelons and to enable more effective utilization of resources. Projects 1AA and 1AB fund congressional special interest items. Project 243 matures signal processing and fusion technologies for Army sensors; matures and demonstrates radio frequency (RF) systems to track and identify enemy forces and personnel; and matures and demonstrates multi-sensor control and correlation for improving reconnaissance, surveillance, tracking, and target acquisition.

Work in this PE is complimentary of PE 0602270A (EW Technology), PE 0602705A (Electronics and Electronic Devices), PE 0602120A (Sensors and Electronic Survivability), PE 0602782A (Command, Control, Communications Technology), and PE 0603270A (EW Technology); and fully coordinated with PE 0602783A (Computer and Software Technology) and PE 0603008A (Electronic Warfare Advanced Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

Work in this PE is performed by the Army Research, Development, and Engineering Command (RDECOM), Communications-Electronics Research, Development, and Engineering, Center (CERDEC), Fort Monmouth, NJ and Aberdeen Proving Ground, MD.

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BA 3: Advanced Technology Development (ATD)						
B. Program Change Summary (\$ in Millions)		FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget		57.062	24.873	29.566	-	29.566
Current President's Budget		50.856	24.873	30.600	-	30.600
Total Adjustments		-6.206	-	1.034	-	1.034
• Congressional General Reductions			-			
• Congressional Directed Reductions			-			
• Congressional Rescissions		-	-			
• Congressional Adds			-			
• Congressional Directed Transfers			-			
• Reprogrammings		-5.177	-			
• SBIR/STTR Transfer		-1.029	-			
• Adjustments to Budget Years		-	-	1.034	-	1.034

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Exhibit R-2A, RDT&E Project Justification: PB 2012 Army								DATE: February 2011			
APPROPRIATION/BUDGET ACTIVITY 2040: <i>Research, Development, Test & Evaluation, Army</i> BA 3: <i>Advanced Technology Development (ATD)</i>				R-1 ITEM NOMENCLATURE PE 0603772A: <i>Advanced Tactical Computer Science and Sensor Technology</i>				PROJECT 101: <i>Tactical Command and Control</i>			
COST (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
101: <i>Tactical Command and Control</i>	13.441	14.702	15.289	-	15.289	15.391	17.566	17.892	18.195	Continuing	Continuing
<p>A. Mission Description and Budget Item Justification</p> <p>This project matures and demonstrates technologies to move and display timely and relevant information across the battlefield to provide commanders at all echelons the situational awareness (SA) that allows them to understand, decide, and act faster than their adversaries, potentially resulting in increased operating tempo (OPTEMPO), improved force synchronization, and reduced fratricide. This project matures and demonstrates technology addressing information storage and retrieval; digital transfer and display of battlefield SA and position/location information; synchronization of combined and Joint force operations; software services optimized for Command and Control (C2) of unmanned air and ground robotic systems; and C2 On-the-Move (OTM).</p> <p>The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.</p> <p>Work in this project is performed by the Army Research, Development, and Engineering Command, Communications-Electronics Research, Development, and Engineering, Center (CERDEC), Fort Monmouth, NJ and Aberdeen Proving Ground, MD.</p>											
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2010	FY 2011	FY 2012	
Title: Integrated Battle Command (BC)								7.907	8.875	8.715	
Description: This effort matures and demonstrates technologies that allow forces to effectively collect, analyze, transfer, and display information in a net-centric battlefield environment. Technology areas include intelligent software agents, server virtualization, knowledge management, and automated query technologies. Work accomplished under PE 0602782A/project 779 compliments this effort.											
FY 2010 Accomplishments: Coded and demonstrated intelligent agent-based BC services for compliance in a service oriented architecture; coded services to generate warnings and alerts relevant to commanders' critical information requirements; matured and assessed methods and software to improve information sharing and collaboration in network-enabled operations; demonstrated and validated data aggregation and alert technologies based on mission context; devised architecture for Warfighter-composable web-based and web-delivered applications; devised framework for the execution of composed applications.											
FY 2011 Plans: Demonstrate dynamic agent based service orchestration to provide workflow adaptation for unexpected events; mature smart filtering services to enable extraction of structured data (graphics, numeric) from free text; finalize and document all software for											

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2010	FY 2011
<p>transition to PM BC; demonstrate and assess agent based BC services hosted at multi-echelons in a representative environment; mature additional functionality in data aggregation and alert capabilities and provide lessons learned; enhance methods and software to improve information sharing and collaboration in network-enabled operations; enhance Microsoft Office applications to allow the Warfighter to adapt them in the field to specific mission requirements; develop web-based gallery to support collaboration of Warfighter-developed applications.</p> <p>FY 2012 Plans: Will validate proof-of-concept for mission context data aggregation and alert algorithm for more effective use of available information; will further create and demonstrate methods to assess information sharing, decision making and collaboration in network-enabled operations to better understand how to align these technologies with Warfighter needs; will demonstrate technologies that enable the software to track progress in meeting mission goals and will provide mechanisms that offer the commander a real-time assessment of the mission; will demonstrate technologies permitting the Warfighter to customize and/or extend decision-enabling software in response to unique and evolving mission needs; will write algorithms to monitor text-based chat conversations, evaluate content meaning, and suggest information from other related chat sessions that may be applicable.</p>			
<p>Title: Command and Control (C2) for Unmanned Systems</p> <p>Description: This effort codes and demonstrates software services that provide coordinated dynamic battle command and tactical control of unmanned systems as well as software tool sets that enable the commander to manage teams of manned and multiple unmanned air and ground platform assets.</p> <p>FY 2010 Accomplishments: Coded and matured software services for collaboration and coordination of unmanned ground vehicles (UGVs) and unmanned aerial systems (UASs) which guide platform behaviors and provide C2 knowledge management of unmanned systems. This provided the capability to manage large numbers of air and ground robots over extended urban and other complex environments, necessitated by expansion in the use of unmanned assets in the battlespace.</p> <p>FY 2011 Plans: Mature mission planning, execution, and monitoring software services to support collaborative, teamed UAS/UGV operations as well as provide greater battlefield awareness and situational understanding for operations in urban terrain; enhance software algorithms for UAS/UGV perception and control technologies which facilitate increased autonomy and more complex missions; incorporate models for terrain and weather effects into planning software to enable more effective planning in complex environments; conduct experiments in modeling and simulation environments to evaluate effectiveness and establish a performance base line.</p> <p>FY 2012 Plans:</p>		3.537	3.759
		3.516	

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B. Accomplishments/Planned Programs (\$ in Millions)				
		FY 2010	FY 2011	FY 2012
Will code user interface enhancements to facilitate manned/unmanned interaction, improve ability to monitor multiple unmanned assets, and improved visualization of vehicle status, task progression, and incoming sensor data; will continue to evolve mission planning, execution, and monitoring software services supporting collaborative UAS/UGV teaming; will continue to enhance software algorithms for UAS/UGV perception and control technologies that potentially facilitate increased autonomy and mission complexity; will continue modeling and simulation activities to evaluate software effectiveness and expand on performance base line.				
Title: Battle Space Awareness and Positioning Description: This effort demonstrates position (pos) and navigation (nav) tools to mitigate the impacts of jamming, terrain features, and obstacles such as buildings that limit the performance of Global Positioning System (GPS)-only navigation systems. FY 2010 Accomplishments: Integrated pos/nav sensors with technologies that exploit the synergy between pos/nav and communications, such as radio frequency (RF) ranging and network-assisted navigation. FY 2011 Plans: Mature an integrated pos/nav suite combining advanced small inertial sensors, advanced GPS technology and algorithms and radio technologies to provide pos/location information in all terrains and environments. FY 2012 Plans: Will complete integration of a pos/nav suite for a software defined radio platform (e.g., Joint Tactical Radio System) combining RF-ranging and network-assisted navigation to provide position location information in all terrains and environments as well as under GPS-degraded conditions.		1.997	2.068	3.058
Accomplishments/Planned Programs Subtotals		13.441	14.702	15.289
C. Other Program Funding Summary (\$ in Millions) N/A				
D. Acquisition Strategy N/A				
E. Performance Metrics Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.				

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COST (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
1AA: <i>Tactical Computer Science Demonstrations (CA)</i>	3.781	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification
 Congressional Interest Item funding for Tactical Computer Science advanced technology development.

<u>B. Accomplishments/Planned Programs (\$ in Millions)</u>	FY 2010	FY 2011	FY 2012
<i>Title:</i> VideoArgus <i>Description:</i> This is a Congressional Interest Item <i>FY 2010 Accomplishments:</i> Created compression/encoding technology to ensure that high definition video is transmitted in a way that captured key digital information that would otherwise be lost in the HD signal compression process.	1.394	-	-
<i>Title:</i> SharedVision <i>Description:</i> This is a Congressional Interest Item. <i>FY 2010 Accomplishments:</i> Developed 3D visualization tools to provide commanders with improved situational awareness, mission planning, and after action reviews while conducting C2 operations.	2.387	-	-
Accomplishments/Planned Programs Subtotals	3.781	-	-

C. Other Program Funding Summary (\$ in Millions)
 N/A

D. Acquisition Strategy
 N/A

E. Performance Metrics
 Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

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COST (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
1AB: <i>SENSOR DEMONSTRATIONS (CA)</i>	6.764	-	-	-	-	-	-	-	-	Continuing	Continuing
A. Mission Description and Budget Item Justification Congressional Interest Item funding for Sensor advanced technology development.											
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2010	FY 2011	FY 2012	
Title: Advanced Radar Transceiver Integrated Circuits Development Description: This is a Congressional Interest Item. FY 2010 Accomplishments: Developed phased array radar technology to support improvements in severe weather detection and quantitative precipitation estimations.								0.795	-	-	
Title: Foliage Penetrating Reconnaissance, Surveillance, Tracking and Engagement Radar (FORESTER) Description: This is a Congressional Interest Item. FY 2010 Accomplishments: Leveraged the current FORESTER design to build, integrate, and test a productized sensor capable of being operationally deployed on a wider array of unmanned aerial system (UAS) platforms utilized by the military and the Department of Homeland Security for surveillance under foliage and border patrol missions.								1.592	-	-	
Title: Mobile Localization Description: This is a Congressional Interest Item. FY 2010 Accomplishments: Addressed processing and analyzing sensor inputs from a single electro-optical/infrared sensor type in order to detect, identify, and provide location data on suspected enemy threats.								1.193	-	-	
Title: Intelligence, Surveillance and Reconnaissance (ISR) Simulation Integration Laboratory Description: This is a Congressional Interest Item. FY 2010 Accomplishments:								1.592	-	-	

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2010	FY 2011
<p>Researched and analyzed sensor and unmanned aerial system (UAS) modeling and simulation (M&S) technologies for incorporation into the UAS SIL (formerly ISR SIL); developed a first generation M&S configuration for the UAS SIL; designed and created physical assets to support UAS payload technology testing.</p> <p>Title: CERDEC Integrated Tool Control System</p> <p>Description: This is a Congressional Interest Item.</p> <p>FY 2010 Accomplishments: Analyzed the current tool container configurations used to support Army aircraft and avionics/weapon systems; designed common configurations to reduce cost, weight and size; and performed research and analysis to add tool control automatic identification technology (AIT) and software to the common tool container configurations.</p>		1.592	-
Accomplishments/Planned Programs Subtotals		6.764	-
C. Other Program Funding Summary (\$ in Millions) N/A			
D. Acquisition Strategy N/A			
E. Performance Metrics Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.			

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COST (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
243: <i>Sensors and Signals Processing</i>	26.870	10.171	15.311	-	15.311	18.172	20.169	21.053	21.414	Continuing	Continuing
A. Mission Description and Budget Item Justification <p>This project matures and demonstrates improved radar, sensor fusion, and correlation technologies for wide area reconnaissance, surveillance, tracking, and targeting of platforms and individuals in all terrains, including complex and urban environments. Sensor fusion efforts mature and demonstrate sensor management, data correlation, and relationship discovery services of a multi-intelligence fusion system. Sensor and simulated sensor candidates may include moving-target-indicator (MTI)/synthetic aperture radar (SAR), electro-optical/infrared (EO/IR), signals intelligence (SIGINT), measurements and signatures intelligence (MASINT), human intelligence (HUMINT), and biometrics technologies. Technologies are matured with significant leveraging of achievements from industry, Defense Advanced Research Projects Agency (DARPA), and other Services.</p> <p>The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.</p> <p>Work in this project is performed by the Army Research, Development, and Engineering Command, Communications - Electronics Research, Development, and Engineering Center (CERDEC), Fort Monmouth NJ and Aberdeen Proving Ground, MD.</p>											
B. Accomplishments/Planned Programs (\$ in Millions)								FY 2010	FY 2011	FY 2012	
Title: Foliage Penetrating (FOPEN) Radar for Unmanned Aerial Systems (UASs)								16.137	2.963	-	
Description: This effort matures and demonstrates a FOPEN radar capability to meet the size, weight, and power requirements for a Class IV UAS. Advancements in both radar and exploitation processing technology enable increased radar performance to include ground and non-metallic building penetration for detection of hidden roadside target/weapons caches.											
FY 2010 Accomplishments: Obtained UAS test bed platform; completed integration of a second FOPEN system; continued integrating data link with radar for remote operation and data dissemination; continued conducting environmental and ground end-to-end acceptance assessments; conducted and completed radar performance flight assessments on a manned surrogate UAS platform; completed first system radar integration on target UAS; conducted UAS flight assessment on first system; began second system radar integration on target UAS.											
FY 2011 Plans: Complete second FOPEN system radar integration on target UAS and conduct UAS flight assessment on second system.											
Title: Ground Moving Target Indicator (GMTI) and Imaging Surveillance Radar								4.891	-	-	

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2010	FY 2011	FY 2012
<p>Description: This effort demonstrates an all-weather GMTI and synthetic aperture radar (SAR) for all-terrain (foliated and open) detection and tracking of mounted and dismounted threats in a package form-fit-function, size, weight, and power compatible with a rotary wing UAS. This effort matures DARPA investments in GMTI and SAR.</p> <p>FY 2010 Accomplishments: Completed development and demonstrated advanced tracking and exploitation algorithms, techniques and tools; demonstrated payload on a manned surrogate platform (UH-60 Blackhawk).</p>				
<p>Title: Measurement and Signature Intelligence Technologies (MASINT) for clandestine tagging, tracking, and locating (TTL)</p> <p>Description: This effort matures and demonstrates MASINT technologies capable of detecting, tracking, and/or identifying human activities and/or infrastructures. The emphasis is to identify appropriate technical approaches, demonstrate embedded processing, and mature algorithms for multi-mode fusion of sensor data. Candidate technologies include: fiber optic seismic/magnetic technologies (highly sensitive for detection of walking personnel with/without weapons and/or tunneling detection); air deployable (air droppable) networked sensor system for a jungle environment (integration of seismic/acoustic sensor with jungle canopy relay); human infrastructure detection technologies (algorithms, sensors, etc); radio frequency MASINT detector, ultra-light multi-target indicator radar for unattended ground sensors and unmanned air vehicles. Work accomplished under PE 0602120A/ project H16 compliments this effort.</p> <p>FY 2010 Accomplishments: Matured and down-selected candidate technologies for TTL based on updated guidance from user community and conducted brassboard demonstrator integration.</p> <p>FY 2011 Plans: Demonstrate/assess brassboard for potential spiral transition to the user community; investigate new TTL technologies to address emerging TTL user requirements.</p> <p>FY 2012 Plans: Will develop technologies that enable clandestine tagging and observation of targets from a distance to include contactless identification sensors, extended operational persistence and range, and forward based fusion and processing.</p>		1.896	1.955	2.376
<p>Title: Weapon-Locating (Ground) radar technologies</p> <p>Description: This effort matures and demonstrates medium-range sensor technologies for locating indirect fire weapons and extending traditional counter-fire target acquisition to shooters operating into or from within natural and urban canyons and firing in improvised fashions (tracks rocket, artillery and mortar targets).</p>		1.972	2.628	4.435

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Matured radar beam forming technologies and multi-aperture/multi-spectral unconventional signal processing (non-Fourier frequency transforms and non-Gaussian clutter estimates) techniques.				
FY 2011 Plans: Develop improved clutter mitigation and discrimination algorithms to accommodate increased occurrence of ground clutter expected with additional radar coverage area.				
FY 2012 Plans: Will complete brassboard system hardware; will conduct component and system level engineering and performance assessment against rocket, artillery and mortar targets fired at non-traditional trajectories; will integrate mature technologies under PM Radars Lightweight Counter Mortar Radar (LCMR(V)3) P3I program and into new radar developments.				
Title: Omni-directional Situational Awareness (SA) (Airborne) radar technologies		1.974	2.625	3.500
Description: This effort matures and demonstrates coupled radar-electro-optical (EO)/infrared (IR) SA technologies for small unmanned aerial systems (UAS) to improve sensing and detection capabilities in support of wide-area persistent surveillance.				
FY 2010 Accomplishments: Developed and matured a Ground Moving Target Indicator (GMTI) radar sensor weighing less than one pound with 360-degree field-of-view and investigated integration with an existing EO/IR payload including control and display software integration techniques necessary to facilitate efficient cueing and complementary usage of GMTI and EO/IR sensors.				
FY 2011 Plans: Mature sensor payload to reduce size weight and power requirements; mature antenna design and processing techniques to support multi-sensor capability.				
FY 2012 Plans: Will fabricate networking radar-EO/IR sensor pairs using ad-hoc methods; will devise network bandwidth and security requirements; will further mature antenna design and processing techniques to support multi-sensor capability and cross-cue to narrower fields of view and auto-tracker; will modify sensor payload to reduce size, weight and power requirements; will harden antenna and electronics design for field environment; and will code command, control, and display application on portable device (PDA, smart-phone, or similar).				
Title: Advanced All Source Fusion		-	-	5.000
Description: This effort develops software technologies for intelligence/battle command (Intel/BC) enterprise collaboration to provide faster and higher quality decision making support for the Commander and his key staff. Specific efforts focus on				

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2010	FY 2011
<p>integrating the Intelligence Surveillance and Reconnaissance (ISR) planning and execution at the task force/battalion level through troop-level as well as efforts that enable the enterprise to identify, fuse, trace/track specific human targets in an asymmetric environment.</p> <p><i>FY 2012 Plans:</i> Will devise a common data model that provides integrity for all data types to include data inter-relationships (time, locations, links, etc) that will provide source-agnostic extraction and exploitation capabilities; will integrate software products for extracting data, identifying, fusing, and tracking of specific entities into the Intelligence Enterprise (DCGS-A, INSCOM, JIEDDO); will code entity extractors, relational reasoning engines, and visualization products; will integrate human assisted extraction, interactive correlation and data mining techniques to enable the data fusion process and assist intel analysts with activity and relationship discovery; will integrate technologies into DCGS-A Systems Integration Laboratory (SIL) and architecture; will integrate biometric data matching and fusion algorithms for use in non-cooperative intelligence collection environment.</p>			
Accomplishments/Planned Programs Subtotals		26.870	10.171
C. Other Program Funding Summary (\$ in Millions)			
N/A			
D. Acquisition Strategy			
N/A			
E. Performance Metrics			
Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.			

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